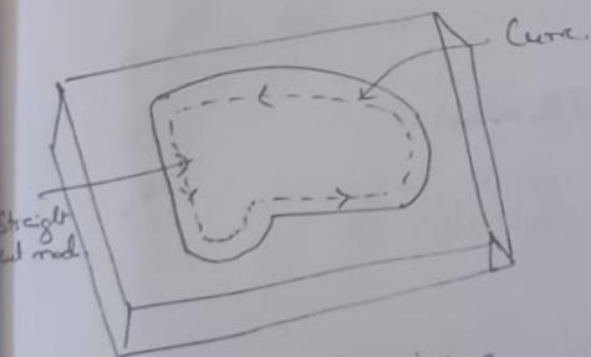


Contouring NC

- Contouring is the most complex, the most flexible and the most expensive type of m/c tool control.
- Capable of performing both PTP and straight-cut operations.
- Capable of controlling more than one axis movement of the m/c tool.
- The path of the cutter is continuously controlled to generate the desired geometry of the workpiece.

(Thus called Continuous-path NC System)

- Straight or plane surfaces at any orientation, circular paths, conical shapes or any mathematically definable form are possible under contouring control.
- In order to machine a curved path in NC contouring system, the dirⁿ of the feed rate must continuously be changed so as to follow the path.
- This is accomplished by breaking the curved path into very short straight-line segments that approximate the curve. Then the tool is commanded to machine each segment in succession.



Applications of NC :-

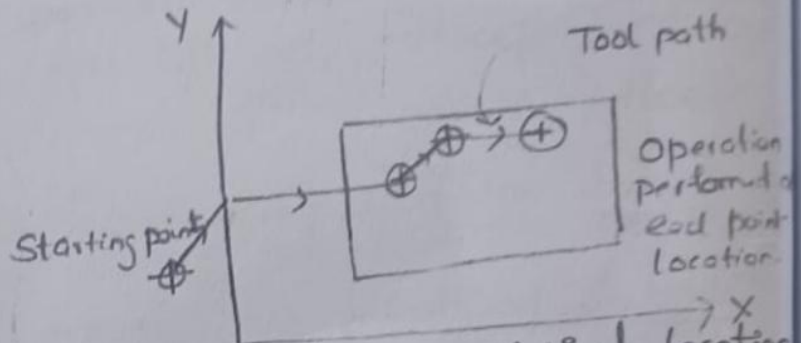
- Milling
- Drilling
- Turning
- Grinding
- Sawing
- Boring

NC MOTION CONTROL SYSTEMS

- In order to do the machining process, the cutting tool and workpiece must be moved relative to each other.
- In NC, there are 3 basic types of motion control systems:
 - 1) Point-to-point (PTP)
 - 2) Straight cut
 - 3) Contouring

Point-to-point NC

- Also called 'Positioning System'.

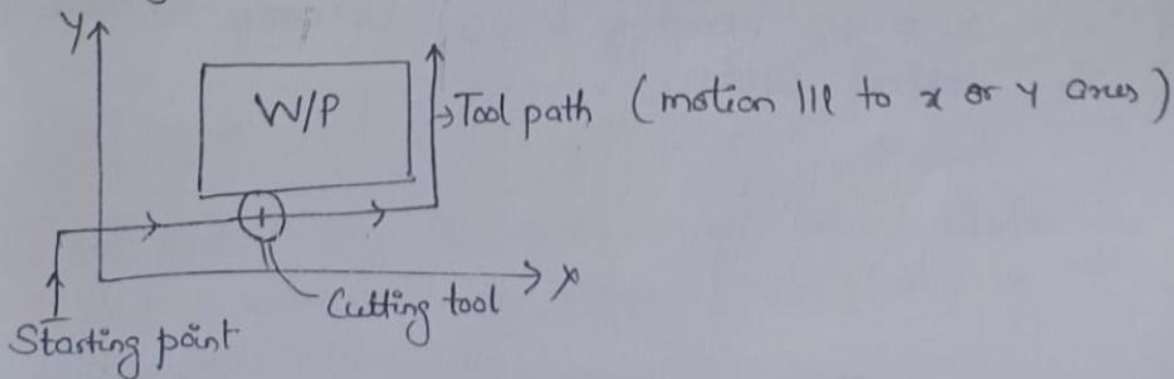


- The objective is to move the cutting tool to a predefined location.
- The path or speed by which this movement is done is not important in PTP.
- Once the tool reaches the desired location, the machining operation is performed at that position.

Ex:- NC drill press.

Straight-cut NC

- Straight-cut control systems are capable of moving the cutting tool parallel to one of the major axes at a controlled rate.
- It is appropriate for milling operations to fabricate workpieces of rectangular configurations.



Where NC should be used:-

- (1) Parts are processed frequently and in small lots/sizes.
- (2) The part geometry is complex.
- (3) Many operations must be performed on the part in processing.
- (4) Much metal needs to be removed.
- (5) Engineering design changes are likely.
- (6) Close tolerances must be held on the workpart.
- (7) The parts require 100% inspection.
- (8) It is an expensive part where mistakes in processing would be costly.

Advantages of NC.

- (1) Reduced non-productive time:- Fewer setups, less time in setting up, reduced workpiece handling time, automatic tool changes on some machines, etc.
- (2) Reduced fixturing:-
NC requires fixtures which are simpler and less costly to fabricate because the positioning is done.
- (3) Greater manufacturing flexibility:-
With NC, it is easy to adapt to engg. design changes, alterations of the production schedule, etc.
- (4) Improved quality control:-
NC produces parts with greater accuracy, reduced scrap & lower inspection requirements.
- (5) Reduced inventory:- Owing to fewer setups & shorter lead times, with NC, the amount of inventory is reduced.
- (6) Reduced floor space requirements:-
Since one NC machining center can do the production of several conventional machines, the amount of floor space required is less than in a conventional shop.

DISADVANTAGES OF NC

- (1) Higher Investment cost
- (2) Higher maintenance cost
- (3) Training NC personnel:- (Requires higher skilled than conventional operators)